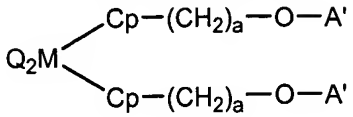
WHAT IS CLAIMED IS:

1. A metallocene compound of Chemical Formula 7:



wherein M comprises a transition metal of Group 4;

Cp, which can be the same or different, comprises a cyclopentadienyl ring, wherein the cyclopentadienyl ring is unsubstituted or substituted by a moiety selected from the group consisting of alkyl, cycloalkyl, aryl, alkenyl, alkylaryl, arylalkyl, and arylalkenyl;

Q, which can be the same or different, comprises halogen or a moiety comprising from 1 to 20 carbon atoms, wherein the moiety is selected from the group consisting of alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene, wherein the alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene;

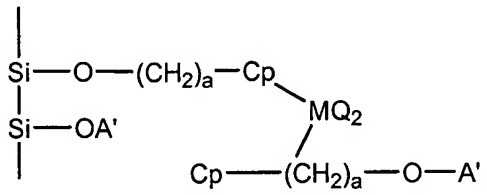
A', which can be the same or different, is selected from the group consisting of methoxymethyl, t-butoxymethyl, tetrahydropyranyl, tetrahydrofuranyl, 1-ethoxylethyl, 1-methyl-1-methoxyethyl, and t-butyl; and

a comprises an integer of from 4 to 8.

2. The metallocene compound according to claim 1, wherein A' comprises t-butyl.

3. The metallocene compound according to claim 1, wherein a is 6.

4. A supported metallocene catalyst of formula:



wherein M comprises a transition metal of Group 4;

Cp, which can be the same or different, comprises a cyclopentadienyl ring, wherein the cyclopentadienyl ring is unsubstituted or substituted by a moiety selected from the group consisting of alkyl, cycloalkyl, aryl, alkenyl, alkylaryl, arylalkyl, and arylalkenyl;

Q, which can be the same or different, comprises halogen or a moiety comprising from 1 to 20 carbon atoms, wherein the moiety is selected from the group consisting of alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene, wherein the alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene;

A', which can be the same or different, is selected from the group consisting of methoxymethyl, t-butoxymethyl, tetrahydropyranyl, tetahydrofuranyl, 1-ethoxylethyl, 1-methyl-1-methoxyethyl, and t-butyl; and

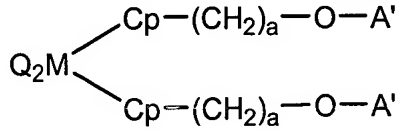
a comprises an integer of from 4 to 8.

5. The supported metallocene catalyst according to claim 4, wherein A' comprises t-butyl.

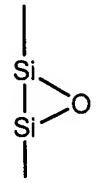
6. The supported metallocene catalyst according to claim 4, wherein a is 6.

7. A method for preparing a supported metallocene catalyst, the method comprising the step of:

reacting a metallocene compound of Chemical Formula 7:



with a silica support of formula:



in an organic solvent, wherein:

M comprises a transition metal of Group 4;

Cp, which can be the same or different, comprises a cyclopentadienyl ring, wherein the cyclopentadienyl ring is unsubstituted or substituted by a moiety selected from the group consisting of alkyl, cycloalkyl, aryl, alkenyl, alkylaryl, arylalkyl, and arylalkenyl;

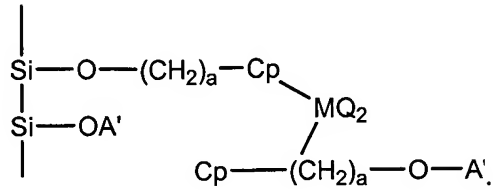
Q, which can be the same or different, comprises halogen or a moiety comprising from 1 to 20 carbon atoms, wherein the moiety is selected from

the group consisting of alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene, wherein the alkyl, alkenyl, aryl, alkylaryl, arylalkyl, and alkylidene;

A', which can be the same or different, is selected from the group consisting of methoxymethyl, t-butoxymethyl, tetrahydropyranyl, tetahydrofuranyl, 1-ethoxylethyl, 1-methyl-1-methoxyethyl, and t-butyl; and

a comprises an integer of from 4 to 8;

whereby one O-A' bond in the metallocene compound of Chemical Formula 7 is cleaved to yield a metallocene portion and A', and whereby two new bonds are formed, wherein the metallocene portion is bonded to a silica atom of the silica support via an oxygen atom, and simultaneously A' is bonded to another silica atom of the silica support via an oxygen atom, to yield a supported metallocene catalyst of formula:



8. The method according to claim 7, wherein the silica support comprises a hydroxyl group amount of less than 0.5 mmol/g.

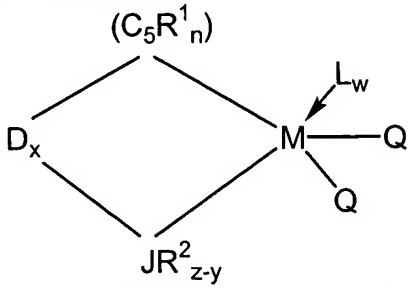
9. The method according to claim 7, wherein A' comprises t-butyl.

10. The method according to claim 7, wherein a is 6.

11. A metallocene compound of Chemical Formula 1 or Chemical Formula 2, wherein Chemical Formula 1 comprises:

$$(C_5R^1{}_m)_pD_s(C_5R^1{}_m)MQ_{3-p}$$

and wherein Chemical Formula 2 comprises:



wherein at least one hydrogen atom of R^1, R^2, and D is substituted by a group of Chemical Formula 6, wherein:

M is a transition metal of Group 4;

$(C_5R^1{}_m)$ and $(C_5R^1{}_n)$ each comprise a cyclopentadienyl ring, wherein each R^1, which can be the same or different, is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} cycloalkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, C_{1-40} arylalkyl, C_{1-40} arylalkenyl, and a metalloid of Group 14 substituted by a hydrocarbyl group; and two R^1 can form a hydrocarbyl group which joins together two adjacent carbon atoms of a cyclopentadienyl ring to form one or more $C_4 - C_{16}$ rings;

D is selected from the group consisting of an alkylene carbon chain, an arylene carbon chain, an alkenylene carbon chain, a dialkyl germanium, a dialkyl silicon, an alkyl phospine, an alkyl amine group substituting on and bridging two cyclopentadienyl ligands, and an alkyl amine group substituting on and bridging a cyclopentadienyl ligand and JR^2_{z-y} ligand by a covalent bond;

R^2 is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, and C_{1-40} arylalkyl;

J comprises an element of Group 15 or Group 16;

each Q, which can be the same or different, is selected from the group consisting of halogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} aryl, C_{1-20} alkylaryl, and C_{1-20} alkylidene;

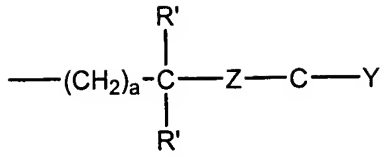
L comprises a Lewis base;

s is 0 or 1 and p is 0, 1 or 2, provided that when p is 0 then s is 0, when s is 1 then m is 4 and p is 1, and when s is 0 then m is 5 and p is 0;

z is a valence number of J, provided that when J is an atom of Group 15 then z is 3, and when J is an atom of Group 16 then z is 2;

x is 0 or 1, provided that when x is 0 then n is 5, y is 1, and w is greater than 0, and when x is 1, then n is 4, y is 2, and w is 0; and

wherein Chemical Formula 6 comprises:



wherein, Z is oxygen atom or sulfur atom;

each R', which can be the same or different, is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, and C_{1-20} arylalkenyl; and two R' can join together to form a ring;

Y is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, C_{1-20} arylalkenyl, C_{1-20} alkoxy, C_{1-20} aryloxy, C_{1-20} alkylthio, C_{1-20} arylthio, phenyl, and substituted phenyl; and Y and R' can join together to form a ring;

a is an integer of 4 to 8, provided that when Z is a sulfur atom then Y is alkoxy or aryloxy; and when Y is not an alkoxy or aryloxy then Z is an oxygen atom.

12. The metallocene compound according to claim 11, wherein Y is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, C_{1-20} arylalkenyl, phenyl, and substituted phenyl.

13. The metallocene compound according to claim 11, wherein Y comprises t-butyl.

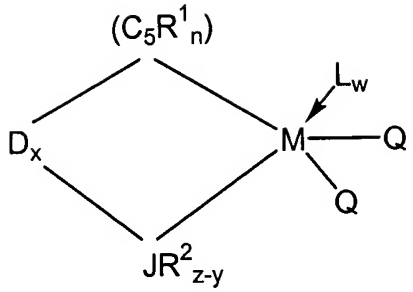
14. The metallocene compound according to claim 11, wherein a is 6.

15. A supported metallocene compound prepared by the reaction of:

a) a metallocene compound of Chemical Formula 1 or Chemical Formula 2, wherein Chemical Formula 1 comprises:

$$(C_5R^1{}_m)_pD_s(C_5R^1{}_m)MQ_{3-p}$$

and wherein Chemical Formula 2 comprises:



wherein at least one hydrogen atom of R^1, R^2, and D is substituted by a group of Chemical Formula 6, wherein:

M is a transition metal of Group 4;

$(C_5R^1{}_m)$ and $(C_5R^1{}_n)$ each comprise a cyclopentadienyl ring, wherein each R^1, which can be the same or different, is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} cycloalkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, C_{1-40} arylalkyl, C_{1-40} arylalkenyl, and a metalloid of Group 14 substituted by a hydrocarbyl group; and two R^1 can form a hydrocarbyl group which joins together two adjacent carbon atoms of a cyclopentadienyl ring to form one or more $C_4 - C_{16}$ rings;

D is selected from the group consisting of an alkylene carbon chain, an arylene carbon chain, an alkenylene carbon chain, a dialkyl germanium, a dialkyl silicon, an alkyl phospine, an alkyl amine group substituting on and bridging two cyclopentadienyl ligands, and an alkyl amine group substituting on and bridging a cyclopentadienyl ligand and $JR^2{}_{z-y}$ ligand by a covalent bond;

R^2 is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, and C_{1-40} arylalkyl;

J comprises an element of Group 15 or Group 16;

each Q, which can be the same or different, is selected from the group consisting of halogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} aryl, C_{1-20} alkylaryl, and C_{1-20} alkylidene;

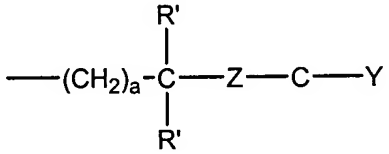
L comprises a Lewis base;

s is 0 or 1 and p is 0, 1 or 2, provided that when p is 0 then s is 0, when s is 1 then m is 4 and p is 1, and when s is 0 then m is 5 and p is 0;

z is a valence number of J, provided that when J is an atom of Group 15 then z is 3, and when J is an atom of Group 16 then z is 2;

x is 0 or 1, provided that when x is 0 then n is 5, y is 1, and w is greater than 0, and when x is 1, then n is 4, y is 2, and w is 0; and

wherein Chemical Formula 6 comprises:



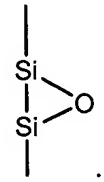
wherein, Z is oxygen atom or sulfur atom;

each R', which can be the same or different, is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, and C_{1-20} arylalkenyl; and two R' can join together to form a ring;

Y is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, C_{1-20} arylalkenyl, C_{1-20} alkoxy, C_{1-20} aryloxy, C_{1-20} alkylthio, C_{1-20} arylthio, phenyl, and substituted phenyl; and Y and R' can join together to form a ring;

a is an integer of 4 to 8, provided that when Z is a sulfur atom then Y is alkoxy or aryloxy; and when Y is not an alkoxy or aryloxy then Z is an oxygen atom; and

b) a silica support of formula:



16. The supported metallocene compound according to claim 15, wherein Y is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, C_{1-20} arylalkenyl, phenyl, and substituted phenyl.

17. The supported metallocene compound according to claim 15, wherein Y comprises t-butyl.

18. The supported metallocene compound according to claim 15, wherein the silica support comprises a hydroxyl group amount of less than 0.5 mmol/g.

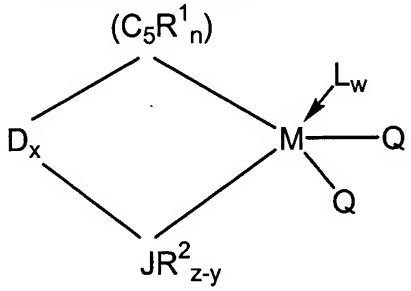
19. The supported metallocene compound according to claim 15, wherein a is 6.

20. A method for preparing a supported metallocene compound, the method comprising the step of:

reacting a metallocene compound of Chemical Formula 1 or Chemical Formula 2 with a silica support in an organic solvent, wherein Chemical Formula 1 comprises:

$$(C_5R^1{}_m)_pD_s(C_5R^1{}_m)MQ_{3-p}$$

and wherein Chemical Formula 2 comprises:



wherein at least one hydrogen atom of R^1, R^2, and D is substituted by a group of Chemical Formula 6, wherein:

M is a transition metal of Group 4;

$(C_5R^1{}_m)$ and $(C_5R^1{}_n)$ each comprise a cyclopentadienyl ring, wherein each R^1, which can be the same or different, is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} cycloalkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, C_{1-40} arylalkyl, C_{1-40} arylalkenyl, and a metalloid of Group 14 substituted by a hydrocarbyl group; and two R^1 can form a hydrocarbyl group which joins together two adjacent carbon atoms of a cyclopentadienyl ring to form one or more $C_4 - C_{16}$ rings;

D is selected from the group consisting of an alkylene carbon chain, an arylene carbon chain, an alkenylene carbon chain, a dialkyl germanium, a dialkyl silicon, an alkyl phospine, an alkyl amine group substituting on and bridging two cyclopentadienyl ligands, and an alkyl amine group substituting

on and bridging a cyclopentadienyl ligand and JR^2_{z-y} ligand by a covalent bond;

R^2 is selected from the group consisting of hydrogen, C_{1-40} alkyl, C_{1-40} aryl, C_{1-40} alkenyl, C_{1-40} alkylaryl, and C_{1-40} arylalkyl;

J comprises an element of Group 15 or Group 16;

each Q, which can be the same or different, is selected from the group consisting of halogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} aryl, C_{1-20} alkylaryl, and C_{1-20} alkylidene;

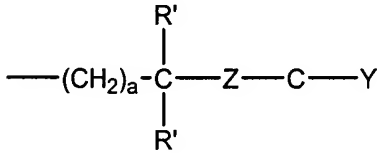
L comprises a Lewis base;

s is 0 or 1 and p is 0, 1 or 2, provided that when p is 0 then s is 0, when s is 1 then m is 4 and p is 1, and when s is 0 then m is 5 and p is 0;

z is a valence number of J, provided that when J is an atom of Group 15 then z is 3, and when J is an atom of Group 16 then z is 2;

x is 0 or 1, provided that when x is 0 then n is 5, y is 1, and w is greater than 0, and when x is 1, then n is 4, y is 2, and w is 0; and

wherein Chemical Formula 6 comprises:



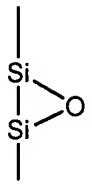
wherein, Z is oxygen atom or sulfur atom;

each R', which can be the same or different, is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, and C_{1-20} arylalkenyl; and two R' can join together to form a ring;

Y is selected from the group consisting of hydrogen, C_{1-20} alkyl, C_{1-20} cycloalkyl, C_{1-20} aryl, C_{1-20} alkenyl, C_{1-20} alkylaryl, C_{1-20} arylalkyl, C_{1-20} arylalkenyl, C_{1-20} alkoxy, C_{1-20} aryloxy, C_{1-20} alkylthio, C_{1-20} arylthio, phenyl, and substituted phenyl; and Y and R' can join together to form a ring;

a is an integer of 4 to 8, provided that when Z is a sulfur atom then Y is alkoxy or aryloxy; and when Y is not an alkoxy or aryloxy then Z is an oxygen atom; and

wherein the silica support is of formula:



whereby an oxygen-carbon bond in Chemical Formula 6 of the metallocene compound is cleaved to yield a metallocene compound portion and a remaining portion, and whereby the metallocene compound portion is bonded to a silica atom of the silica support via an oxygen atom, and simultaneously the remaining portion is bonded to another silica atom of the silica support via an oxygen atom.